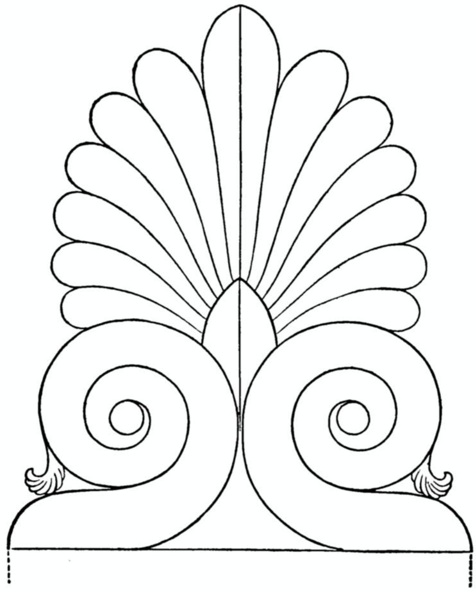
Journal of the Society of Arts.

FRIDAY, SEPTEMBER 11, 1868.

Announcements by the Council.

WHITWORTH SCHOLARSHIPS.

SPECIMEN, IN A REDUCED SIZE, OF SECOND GRADE FREE-HAND DRAWING EXERCISE.



Competitors for the Whitworth £100 Scholarships will be required to produce a certificate of having passed in the ability to draw outlines like the above either enlarged or reduced in size from a copy. The examinations will be held at any school of art or night class in the United Kingdom, during the month of May, 1869, or, if specially required, at a science school.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or " churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed " Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

CANTOR LECTURES.

"ON FOOD." By DR. LETHEBY, M.A., M.B., &c.

LECTURE III., DELIVERED MONDAY, FEBRUARY 3.

Construction of Dietaries: Preparation and Culinary Treatment of Foods.

(*Continued from page* 723.)

In the treatment of animal food there are several points for consideration. In the first place it is always best to prepare the animal for the shambles by fasting it for a few hours before it is slaughtered, as partially digested food, and the food recently absorbed into the system, quickly pass into a state of putrefactive decomposition and taint the whole carcase; besides which, a day's repose is often necessary to quell the excitement occasioned by the journey or voyage which the animal may have made on its way to the place of slaughter. In the second place, it is proper to remove as much blood from the body as possible at the time of killing, as this also is apt to pass into a state of decay. The regulations of the Jews in this particular are most effectual, and are derived from very ancient statutes in Leviticus, which ordain that no manner of blood, whether it be of fowl or of beast, shall be eaten by man; and with the view of

letting as much of it flow away as possible, the practice is to slaughter every animal by cutting its throat with a sharp knife. There are, indeed, the most precise rules for this purpose. In some countries, however, the blood is regarded as a very nutritious part of the animal, and great pains are taken to prevent its escape. Dr. Livingstone says, that many of the South African tribes kill the beast by thrusting a javelin into the heart, so as to prevent the loss of blood. But in these cases the meat is never kept, but is eaten directly after the animal is slaughtered. A proposition has also been made in this country for killing animals by letting air into the pleural cavities, whereby the lungs collapse, and so cause almost instant death by asphyxia without loss of blood; but the practice is objectionable, not merely because of the liability of such meat to quick putrefaction, but also because of the difficulty of discovering disease in it.

In the third place it is proper that the carcass of the animal should be allowed to cool and set thoroughly, before it is packed for conveyance to the market. If this is not properly attended to it soon decays. It should also be packed loosely, or even freely exposed to the air, as the colouring matter of the blood and muscles continue to absorb oxygen, and to breathe, as it were, for some time after death, and while this goes on decay is arrested.

Lastly, all meat should be kept a little short of decomposition before it is cooked, or even until decomposition has just commenced, as the tissue then becomes loose and tender, and very digestible.

In the culinary treatment of animal food, the objects are fourfold:—

1st. To coagulate the albumen and blood of the tissues, so as to render the meat agreeable to the sight.

2nd. To develop flavours, and to make the tissue crisp, as well as tender, and therefore more easy of mastication and digestion.

3d. To secure a certain temperature, and thus to be a means of conveying warmth to the system.

4th. To kill parasites in the tissues of the meat.

Now, as the researches of Dr. Beaumont and others have demonstrated that meat is always rendered more and more indigestible in proportion to the prolonged action of heat, it is highly necessary that the temperature should not be continued beyond the point necessary to accomplish these objects. Liebig says, that a temperature of 133° Fahr. will coagulate albumen, and that the red colouring matters of the blood and muscle are coagulated and destroyed at from 158° to 165° (say 170°). He therefore advises that all cooking operations, in respect of meat, should be limited to 170°. His directions are that, in *boiling* meat it should be introduced into the vessel when the water is in a state of brisk ebullition, and that the boiling should be kept up for a few minutes. The pot is then to be placed in a warm situation, so that the water is maintained at from 158° to to 165°. The effect of this is, that the boiling water coagulates the albumen and tissue upon the surface of the meat, and to a certain depth inwards, and thus forms a crust which does not permit the juice of the meat to flow out, nor the water to penetrate into the meat. The flesh, therefore, retains its savoury constituents, and is not too sodden; but if, on the other hand, the meat be set upon the fire with cold water, and then slowly heated to boiling, the flesh undergoes a loss of soluble and savoury matters, while the soup becomes richer in them. The albumen, in fact, is gradually dissolved from the surface to the centre; the fibre loses, more or less, its quality of shortness or tenderness, and becomes hard and tough. The thinner the piece of flesh is, the greater is its loss of savoury constituents.

This explains the well-known observation, that that mode of boiling which yields the best soup, gives the driest, toughest, and most vapid meat; and that, in order to obtain well-flavoured and eatable meat, we must relinquish the idea of making good soup from it.

If finely chopped flesh be slowly heated to boiling with an equal weight of water, and be kept boiling for a few minutes, then strained and pressed, we obtain the very strongest and best flavoured soup which can be made from flesh. When the boiling is longer continued, some little additional organic matter is dissolved, but the flavour and other properties of the soup are thereby in no degree increased or improved. By the action of the heat on the fibres of meat, a certain amount of water or juice is always expelled from them; whence it happens that the flesh loses weight by boiling, even when immersed in water (as much sometimes as 24 per cent. of the weight of the raw flesh). In larger masses this loss is not so great.

Even in *roasting* meat the heat must be strongest at first, and it may then be much reduced. The juice which, as in boiling, flows out, evaporates, in careful roasting, from the surface of the meat, and gives to it the dark brown colour, the lustre, and the strong aromatic taste of roast meat. It is doubtful, however, whether the heat of 170° is sufficiently high to ensure the destruction of the parasites of meat, and therefore, I would advise that the temperature should be as nearly as possible to that of boiling water (212°).

Of the four methods of cooking which are commonly practised in this country—namely, *boiling*, *baking*, *roasting*, and *frying*, the former is undoubtedly the most economical, and produces the most digestible food, but the flavour of the meat is not well developed, and it is quite unsuited for many descriptions of meat; the flesh of young animals, for example, consisting of an undue proportion of albumen and gelatine in the tissues, will boil away to a large extent, and so will lose fatty tissue, like that of American bacon; and, indeed, unless the process is well managed, there will always be considerable loss, as I have just stated, from the escape of albumen, saline matter, and the alkaloids of the meat, into the water, amounting sometimes to from 16 to 24 per cent. of the weight of the joint; and that these are valuable constituents of flesh, is proved by the experiments of the French Academicians, who found that when a dog was fed daily upon half a pound of boiled flesh, which had been previously soaked in water and pressed, it quickly lost weight, as much, indeed, as one-fourth of its entire weight in 43 days; and in 55 days the emaciation was extreme. Of course, these observations do not apply when the liquor in which the meat is boiled is eaten with it, as in the case of hashes, stews, &c.

Dr. Pereira states that, at the Wapping Workhouse, where mutton (chiefly fore-quarters) and beef (consisting of the brisket, thick and thin flanks, leg of mutton pieces, and clods—all free from bone) were boiled, the average loss in weight was only about 17½ per cent.; but this is under the common proportion, and shows that the meat was from old and lean animals. The ordinary loss of weight in cooking is about as follows in every 100 parts:—

	Boiling.	Baking.	Roasting.
Beef generally	20	29	31
Mutton generally	20	31	35
Legs of mutton	20	32	33
Shoulders of mutton	24	32	34
Loins of mutton	30	33	36
Necks of do.	25	32	34
Average of all	23	31	34

But although the loss of weight in baking and roasting is greater than in boiling, yet it is chiefly from evaporation, and from the melting of the fat. Flavours also are developed which give a pleasant relish to the meat; but there are many disadvantages to these methods of cooking, as that the surface of the joint is often overdone, when the interior is almost raw; and that the action of the heat on the superficial fat frequently produces acrid

compounds (consisting of *acrolein* and *fatty acids*) which are very distressing to a sensitive stomach. This is always the case when meat is fried or grilled, and is thus subjected to a temperature of 600° or more; in fact, all baked and roasted fatty foods are apt, on this account, to disagree with delicate stomachs; and it is often remarked that, although bread and butter, boiled puddings, boiled fish, or boiled poultry can be eaten freely without discomfort, yet toast and butter, or meat pies and pastry, or fried fish, or roasted fowl will disagree with the stomach. The practice of covering poultry and game with lard, or oiled paper, or thin dough, or even with clay (feathers and all, as is the Indian custom), and then roasting, is no doubt advantageous, as it modifies the temperature and prevents the formation of acrid fatty compounds. It was by some such device as this that Aristoxenes was able to serve up a pig apparently boiled on one side and roasted on the other—the savoury crackling being suited for stronger stomachs, while the more delicate side of it was best adapted for weaker digestions.

In deciding, however, on the proper method of cooking a joint, regard must always be had for the kind of flavour that is to be developed. Shoulders of mutton and fresh beef are rarely boiled, because of their insipidity. The same is the case with game and poultry, for the barn-door fowl and turkey are nearly the only examples of the latter which can be boiled, and there are no such examples among the former. What should we think of a boiled pheasant? A story is told by a writer in the Society's *Journal* of a poacher who wished to seduce a bumpkin new poacher by a practical illustration of the fine flavour of game, and calling at his cottage one day, he left for him a hare warm from the chase, telling him to cook it, and to try if it warn't a nice dinner for nothing. A week after he called again, and asked him how he liked his dinner. "Didn't loike it at all," exclaimed the recipient. "Well, man," says the poacher, "how did e cook en?" "Why, biled en in tarmuts, to be zure." I won't attempt to describe the disgust of the poacher. The same is the case with venison, although it may be boiled, especially when it is rather high, for about half the time necessary for cooking it, yet it must be roasted, in order to develop its flavour. Hunters in the wild prairies of America are accustomed to cook the flesh of the deer by *brittling* it in the following manner:—They strip off the long muscles from each side of the spine, both above and below, and tie them up in a roll, after well smearing them with oil or fat; they then roast them, and baste them perseveringly with oil. If opportunity permits they sprinkle them with lemon juice before they are oiled and made up into a roll. The flavour of roasted meat and its grateful effect on the sense of smell must have been recognised in very early times, for burnt-offerings are frequently spoken of by Moses as "a sweet savour unto the Lord," and particular accounts are given of the manner in which these offerings of the lamb and the kid, &c., were to be made acceptable, not merely to the Lord, but also to Aaron and his sons, who were to eat of them. How far back in history the flavour of roast-pig was eulogised I know not, but it is immortalised in the essay of Charles Lamb. As for the process of *baking* meat, it is not nearly so refined as that of roasting, although it has one advantage, in the circumstance that the temperature can be more easily regulated than with roasting.

In making *soup* the object is to extract, as completely as possible, all the soluble constituents of the meat or bone, and when the latter is used it should be chopped or broken into small pieces, and boiled for a considerable time—not less than nine or ten hours. Shin-bones will then yield about 19 per cent. of their weight of fat and gelatine—the soup being, according to Dr. E. Smith, very nutritious, so that 6 lbs. of bones will produce a soup that contains the nutritive power of 2 lbs. of meat, as far as carbon is concerned, and of 1 lb. of meat in respect of nitrogen; but although this may be so as regards the actual quantities of carbonaceous and nitrogenous matters present, yet it is very doubtful whether they are equally nutritious, for in the renowned experiments of the French gelatine commission it was found that the soup or jelly from boiled bones would not support the life of dogs, although raw bones, in like proportion, would.

Ox-tail soup is much richer than that from bones alone, as it contains the saline and other constituents of flesh. It is now a favourite and rather expensive soup, although at one time, it was the humble fare, and almost the only nitrogenous food of the poor Protestant French refugees of Clerkenwell. Prior to the year 1689, or thereabout, the butchers of London left the tails attached to the hides, which were sent to the tanners of Bermondsey, but the poor French refugees, in their extremity of want, bought the tails for a mere trifle, and converted them into soup, which was soon found to be of excellent quality.

Soup made from meat should be obtained in the way already described—that is, a given weight of meat, chopped fine, should be allowed to macerate in its own weight of cold water, and should then be gradually heated to the boiling-point, after which it should be strained and pressed. In this way about three per cent. of the nutritious matter of the meat is dissolved, besides the saline constituents. If the soup be simmered with the meat for some hours, a larger proportion of organic matter, chiefly gelatine, will be dissolved; and a good soup thus made from shin of beef will contain about 600 grains of solid matter in a pint, and of this about 39 grains are saline.

Lean meat contains about 25 per cent of solid matter, the rest being water, and of this from 7 to 10 parts are soluble in cold water; rather more than half of this is albumen and miochrome (colouring matter), which are coagulated by heat, and thus, if the cold solution of flesh be boiled, it contains only from 3 to 4 per cent. of the meat; and when evaporated to dryness it constitutes the *extractum carnis* of Liebig. It can hardly be said, however, that the nutritive power of this extract is very great, for its chief constituents are *certain acids, lactic* and *inosic*, with *enosite, creatine, creatinine*, and an indefinite colloidal organic substance of a brown colour and syrupy consistence; besides which it contains the soluble saline matters of the meat, as phosphate and chloride of potassium, with a little chloride of sodium. Analyses of this extract, as found in commerce, have furnished from 41 to 60 per cent. of water, from 22 to 41 per cent. of organic matter, and from 8 to 16 per cent. of saline matter. The extract is always acid; and it should be of a pale yellowish-brown colour, with an agreeable meat-like odour and taste. It should also be perfectly soluble in cold water, and should not contain albumen, fat, or gelatine.

False views have been entertained of the nutritive power of this extract, for, as one pound of it represents the soluble constituents of from 30 to 34 pounds of lean meat, or from 45 to 48 pounds of ordinary butchers' meat, it has been assumed that its nutritive power is in this proportion; but Liebig has taken care to correct this error, by showing that the extract, when properly prepared, merely represents the soup or beef-tea obtainable from that quantity of meat; and, as it is deficient of albumen, it must be conjoined to substances which are rich in this material, as beans and peas. No doubt the physiological action of the extract is due to the alkaloids which it contains; and as the former of these are of tea and coffee (theine or caffeine) in their effects on the body, it must be concluded that extract of meat is more of a vital restorative than a nutritious food. It is from this point of view that Parmentier, Proust, and even Liebig himself are disposed to regard the physiological effects of the preparations. "In the supplies of a body of troops," says Parmentier, "extract of meat would offer to the severely-wounded soldier a means of invigoration which, with a little wine, would instantly

restore his powers, exhausted by great loss of blood, and enable him to bear being transported to the nearest field hospital;" and, in almost the same language, Proust remarks that "we cannot imagine a more fortunate preparation under these circumstances; for what more invigorating remedy, what more powerfully-acting panacea than a portion of genuine extract of meat dissolved in a glass of noble wine?

As in the case of soup and beef-tea, its nutritive power must be assisted by vegetables and other substances which are rich in nitrogenous matters. Conjoined, therefore, with wheaten flour, with peas or lentils, or even with the gluten obtained in the manufacture of starch by Durand's process, it may be made to have the nutritive power of meat. Already there is a preparation of it by Messrs. Peek, Frean, and Co., in which the extract is mixed with baked flour and pressed into small biscuits; indeed, as far back as the year 1851, Mr. Borden, jun., obtained a patent for combining extract of meat with flour, farina, or meal, and baking it in the form of biscuits. In this manner, by using the extract of 5 lbs. of meat with 1 lb. of flour, he produced biscuits which contained 32 per cent. of nitrogenous matter, and 1 oz. of the biscuit grated into a pint of water, then boiled and flavoured, made a good soup. In the case of Liebig's extract of meat, one pound of the preparation is sufficient, with the usual rations of potatoes and other vegetables, to make soup for 130 men; and a strong broth is made by dissolving a teaspoonful of it (about 150 grains) in half a pint of boiling water, and flavouring with salt and pepper.

A still more nutritious broth, containing the albumen of the meat, is obtained by infusing a third of a pound of minced meat in 14 ounces of cold soft water, to which a few drops (4 or 5) of muriatic acid, and a little salt (from 10 to 18 grains) have been added. After digesting for an hour or so, it should be strained through a sieve, and the residue washed with 5 ounces of water and pressed.

The mixed liquids thus obtained will furnish about a pint of *cold extract of meat*, containing the whole of the soluble constituents of the meat (albumen, creatine, creatinine, &c.), and it may be drank cold, or slightly warmed—the temperature not being raised above 100° Fahr. for fear of coagulating the albumen.

There are many questions connected with the economy of cooking which I have not time to discuss, but I may state that this Society has done good service for the community in obtaining valuable information as to the simplest and cheapest apparatus for the purpose. Foremost among them is the cooking-pot of Captain Warren. It is a sort of double sauce-pan, and is easily made by fitting a small covered sauce-pan into a larger one. The inner vessel contains the joint or other thing to be cooked, and the outer one has a little water in it, so that the temperature in cooking can never exceed 212°. By this means the joint is cooked in its own vapour without coming into contact with water or steam, and thus it cannot lose its soluble constituents; and if it be desired to improve the flavour of the joint just cooked, it may be afterwards roasted for a short time before the fire. The loss in weight under these circumstances is not nearly so great as in the common way of cooking, and the flavour and tenderness of the meat are considerably increased; besides which, there is the certainty of cooking the joint equally throughout, without over-dressing it. Moreover, by the adaptation of a steamer to the outer vessel, vegetables may be also cooked at the same time. When the meat is boiled by this process, there is little or no loss of weight, and even when it is afterwards roasted, for the purpose of improving its flavour, the loss is not nearly so great as when a joint is roasted in the ordinary way. In one experiment it was found that 15 lbs. of meat roasted in the usual manner, in the kitchen of the Cambridge Barracks, lost 4 lbs. 4 ozs. in weight, whereas the meat cooked in Captain Warren's pot, and then roasted, lost only 2 lbs. 15 ozs., so that there was a gain of 1 lb. 5 ozs.

Another apparatus of very great ingenuity is a cooking-pot from Switzerland, where the saucepan containing the joint and a little water is, after boiling for a short time, placed in a box lined with felt, and thus left for an hour or two to cook, the conducting power of the felt being so bad that the heat is retained in the most perfect manner. The apparatus is not only economical, but it is also excellently well suited for picnic parties, or for soldiers on the march, who may thus secure a hot dinner, cooked while on the journey.

The cooking appliances of the poor are very imperfect, and hence they resort to the cook-shops of their neighbourhood; but even then their meals are scanty and wretchedly cooked. In the poor districts of London three halfpence is the usual expenditure for a dinner by children—a penny going in pudding, and the halfpenny in potatoes. If they pay twopence they are allowed to sit down, and have a little gravy with it. Everybody has heard how the poor of Paris dine *à la squirt*, where the tin soup basins are nailed to the table, and where the attendant Leonoras draw up the seething soup from a hidden cauldron by means of a huge syringe, from which it is driven out into the customer's basin. The price of the meal (4 sous) must be instantly paid down, or the callous handmaid sucks up the soup again into the monster squirt. Scenes like this, and even worse than this, in the abodes of the poor have urged philanthropists to seek a better means of supplying their wants, without trespassing upon the dangerous ground of charity. In Paris an enterprising widow (Madame Robert) conceived the idea of giving a poor man a good dinner for twopence. Her daily bill of fare was cabbage-soup, a slice of bouilli (beef), a piece of bread, and a glass of wine; and thus, in the neighbourhood of the Marché des Innocents, did she daily provide for some six thousand workmen, who took their dinners in the open air, but sheltered from the weather; and she gained a farthing by each guest. In this country a like benevolence has set on foot, with more or less success, in different places, restaurants for the poor. In Glasgow, for example, the working-class dining-rooms, which are far above the rude accommodation of Madame Robert, are established to provide a substantial dinner for 4d. or 5d. Long ago the special correspondent of the *Daily Telegraph*, in writing about them, said that he obtained a capital dinner of good pea-soup, boiled beef, ten ounces of potatoes, and pudding—more than he could eat—for the sum of 5½d.; and a writer in the *Times* also stated that for 4½d. he had a pint basin of pea-soup, a plate of hot minced collops, a plate of potatoes, and eight ounces of bread; while his companion had, for the same sum, a pint basin of broth, a plate of cold beef, a plate of potatoes, and a slice of plum pudding, all excellent in their quality, and well cooked. The practice in these places is to provide daily a variety of hot foods, as soup, broth, potatoes, rice, cabbage, pudding, tea and coffee, besides bread and butter, cold pressed beef and ham; and every ration, except meat, is so apportioned as to be sold at the uniform price of a penny. The meat costs three halfpence; and, with the view of clearing off the remainder of the soup after the proper dinner hour, so that a fresh quantity may be made every day, it is the practice to sell the soup and broth, at half-price, from six o'clock to eight o'clock in the evening, and then to give the remainder away. All the articles are of the best quality, and are well cooked. They are bought by contract at wholesale prices; and, although they are sold so cheaply, yet they yield a small profit, and so give the system the stability of a commercial enterprise.

Very recently, too, Mr. Riddle has proposed, in a paper which was read before this Society, that arrangements might be made for cooking dinners on a large scale, and sending them out to the houses of the poor. He proposes to prepare, daily, good rations of roasted, baked, and boiled meat, with vegetables, and to send them out in 2lb., 4lb., or 6lb. tin canisters, all ready for immediate use, and kept warm in little compartments of a properly-

constructed cart. There would be no difficulty about this, and the meat might be delivered in excellent condition, and with great punctuality. None but those who are acquainted with the utter helplessness of the poor in the matter of cooking food, or who know the difficulties of even better classes of persons in this matter, can form any notion of the value of such a proposition; and I should be glad to see it realised.

Proceedings of Institutions.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*The "Whitworth Scholarship."*—The Leeds Town Council, at their meeting on August 12, appointed a committee to award, to the most suitable candidate, the exhibition of £25, placed at their disposal by Mr. Whitworth, to enable a person from Leeds to compete for the Whitworth Scholarship at the examination to be conducted in May of next year. After examining into the claims of several candidates, the committee have awarded the exhibition to Mr. Oliver Pegler, who has gained the following prizes and certificates in the examinations of the Society of Arts and the Department of Science and Art, through the Leeds Mechanics' Institution Local Board:—Society of Arts, 1867—3rd-class certificate in chemistry. 1868—1st-class certificate in chemistry; 2nd-class ditto in freehand drawing; 3rd-class ditto in electricity and magnetism. Science and Art Department, 1867—1st-class certificate and Queen's prize in inorganic chemistry. 1868—1st-class certificate and Queen's medal in organic chemistry; 2nd-class in magnetism and electricity; 3rd-class in acoustics, light, and heat; 3rd-class in mining; 3rd-class in metallurgy. *Hunslet Mechanics' Institute.*—At a special meeting of the Board of Directors, held Friday, September 4, 1868, Mr. Alderman Blackburn, President, in the chair, after an explanation of the aid offered by the Department of Science and Art had been given by Mr. Henry H. Sales, it was unanimously resolved to organise a class for the study of elementary chemistry forthwith.

EXAMINATION PAPERS, 1868.

(*Continued from page 724.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

FLORICULTURE.

THREE HOURS ALLOWED.

1. Name for each month in the year three popular flowers, which can be had in profusion for decorative purposes, indicating whether they come into bloom naturally, or require to be forced.
2. Explain in detail the operation of planting a tree or shrub of moderate size, indicating all the more essential points to be attended to.
3. Mention all the cultivated species of Tacsonia known to you, and show how they may be popularly distinguished.
4. How would you tell a Pteris from a Polypodium, and how a Polypodium from an Aspidium?
5. Cheilanthes, Trichomanes, Gymnogramma, and Osmunda, are all Ferns. Would you consequently treat them all alike as to the supply of moisture afforded them? If not, explain what difference you would make.
6. In what condition of the sap would you perform the operation of pruning, and for what reason?
7. Name a score of the best modern bedding plants for colour, and the same number for producing foliage effects.
8. Name a good selection of Lawn Grasses, and state the proportions of each which should be sown to ensure a good turf, giving the quantities proper for sowing an acre.
9. Explain the principal differences of treatment respectively conducive to foliiferous and floriferous growth in plants entirely under the control of the cultivator.
10. State what you believe to be the chief merits and defects of the different kinds of hot-water boilers known to you.
11. In hybridising plants, has any general result as to the influence of the male and female parents respectively been observed, and if so, what is it?
12. Explain the general features of the treatment required by the following subjects respectively:—Ferns, Orchids, Cacti, Heaths, Hardy Annuals, and Bedding Plants.

FRUIT AND VEGETABLE CULTURE.

THREE HOURS ALLOWED.

1. When is grafting to be performed? Describe the process in detail.
2. When is budding to be performed? Describe the process, and state the condition in which the scion and stock must be for the operation to be successfully performed.
3. What produces rust in grapes, and how would you prevent it?
4. How would you distinguish the fruit of Elruge nectarine from that of Violette hâtive, and is there any characteristic by which the trees may be distinguished?
5. How would you distinguish the fruit of Roman nectarine from that of Pitmaston orange, and what characteristic distinguishes the trees?
6. Describe the mode of forcing strawberries, the preparation of the plants, the subsequent culture, and the varieties best adapted for the purpose.
7. Give as complete a list as you can of the plants grown as salads, distinguishing those for summer and those for winter use.
8. Describe the culture and management of the cucumber by training it over a trellis, so as to furnish a supply of fruit during the months of December and January.
9. How would you keep up a supply of coleworts and cabbages by merely two sowings in the year? Give the details of the process.
10. How would you distinguish salsify from scorzonera when growing? and how by the roots?
11. Describe the process of forcing the mushroom.
12. What soil would you select as best for a crop of broccoli, what for carrots, and what for onions?
13. What influence has light on plants?
14. How do plants absorb nutrition?

ANIMAL PHYSIOLOGY.

THREE HOURS ALLOWED.

Candidates may answer any four of these six questions, but only four. If any paper is found to contain answers to more than four questions, marks will be given for the first four only of those answers.

1. State the properties of gastric juice, and its effect upon food. Briefly describe the various circumstances which affect the quantity and quality of gastric juice, explaining the manner in which they act.
2. Explain the structure and the use of the arteries.
3. Give the composition of urine, indicating the nature of its constituents. What purpose in the economy does the secretion of urine serve?
4. Compare the eye and the ear, both as regards structure and function.
5. What are the essential differences between the work done by (*a*) a simple nerve; (*b*) the spinal cord; (*c*) the brain?
6. Give a brief sketch of the structure and functions of the larynx.

DOMESTIC ECONOMY.

THREE HOURS ALLOWED.

1. Describe the effects of roasting, baking, broiling, frying, boiling, and stewing as regards economy, and the comparative suitability of these processes in the preparation of meat for food.

2. What are the most important substances composing the flesh of animals?

3. Prepare a table of diet for a poor family. Explain the advantages of the various substances which you would use, having regard to economy, and the health and strength of the members of the family.

4. Give a full account of the properties and uses of milk.

5. Mention some of the common condiments, their special uses, and the effects they have when taken into the animal system.

6. What species of fungi are eatable, and mention some of the indications by which the wholesomeness or unwholesomeness of this class of vegetables may be known?

7. What are the usual adulterations in milk, ground pepper and coffee, bread, and how may they be detected?

8. What means are commonly employed for purifying water? How far are they severally effectual? What are the effects of the impurities in water in a sanitary or economical point of view?

9. Mention the chief points for consideration in the selection of a house in a town, to contain eight beds, as respects the site, design, aspect, and materials of construction.

10. Mention similar details respecting the selection of a house in the country.

11. Explain the process of respiration, and the effects of bad ventilation upon the constitution.

12. Mention the several advantages of a small fire in a sick room, even in warm weather.

13. State what ought to be done, and what ought specially to be avoided, in the treatment of a frozen person or a frost-bitten part.

14. State what ought to be done, and what ought specially to be avoided, in the treatment of scalds or burns.

15. In a case of severe bleeding from a wound in the leg or thigh, state what should be done in the absence of a medical man.

16. State the causes that predispose to typhus fever and cholera.

17. Give rules for the general management of a sick room, as respects air, light, and warmth, furniture-cleaning, quiet, food, and drink.

18. Describe the different modes in which small savings may be turned to a good account.

19. What is the expense of carpeting a room 28 feet long, and 19 feet wide, with carpet three-quarters of a yard wide, at 5s. 9d. a yard?

20. I owe a tradesman £528 9s., which will be due to him four months hence, at 4½ per cent. interest. What should I save if I paid the debt immediately?

(*To be continued.*)

ART INSTRUCTION AFFORDED THROUGH THE SCIENCE AND ART DEPARTMENT.

The following is taken from the 15th report of the Department of Science and Art:—

The National Art Training School.—The head master's report for the year ending 31st of July shows that 28 students, in training for masterships of Schools of Art, have received allowances for maintenance, of whom four have been appointed to local Schools of Art. Free studentships were allowed to 37 students who had been successful in obtaining medals or passing examinations; 16 sappers of the Royal Engineers, and 30 other persons, either former students in training, national scholars, or persons in the employment of the Department, have attended the school without payment of fees, making a total of 118 free students. Three certificates of competency as masters for Schools of Art were granted after examination to students in receipt of allowances, and six to other candidates in the school.

Twenty-three students in training as designers or art-workmen have received allowances for maintenance as national scholars. Of these, three have obtained remunerative employment as designers within the term of four sessions, to which these scholarships are limited, and two others, at the expiration of their scholarships, have obtained employment as ornamentists of a high class.

Students in training have been under instruction in etching by Mr. R. J. Lane, A.R.A., and a second volume of 50 of their etchings has been published, and will be distributed among those Schools of Art in which the students have shown, by their previous progress, that they are likely to make good use of such works.

Together with students in training, the general public are admitted to the school on payment of adequate fees; 422 students paid fees for the first session of the year, and 406 for the second session. The amount paid in fees was £1,964 2s. The total number of individual students in the year was 727, as compared with 807 in the preceding year. This reduction has been influenced by a change in the regulations for the admission of students, which excludes amateurs desirous of taking a few lessons only.

Schools of Art.—Ninety-eight schools of art are now in operation. They give instruction to 17,341 students, a slight increase as compared with 1867. One, a branch school at Abingdon, has been closed, another, at Greenock, has ceased to fulfil the conditions of an art school, and has become a night class for artizans. New schools have been established during the year at Dorchester and Kilmarnock.

The professional examiners of the works sent up to the national competition, report that the designs submitted to them show that the work of these schools is acting satisfactorily upon the manufactures of the country.

Six certificates of qualification as masters of schools of art, and 185 certificates of qualification to give instruction in elementary drawing in schools for the poor, and night classes, have been taken by students of local schools.

Twenty-one schools of art have availed themselves of the use of the collections at South Kensington by borrowing works for study in the schools, and 14 have had loans of objects for exhibition.* Special grants of examples and works of art have also been made to various schools.

Night Classes.—The encouragement given towards instruction in drawing in classes, of pupils above 12 years of age meeting after 6 p.m. in national or parochial schools, and in working men's, mechanics', or similar institutions, has extended these classes during the second year of their action from 32 to 72, while the number of students has doubled—from 1,140 in 1866 to 2,533 in 1867. The examinations of these classes are framed to induce such a course of study as shall prepare the pupils for the more advanced or more technical classes in the schools of art or of science.

Schools for the Poor—Aid towards instruction in drawing in these schools, formerly administered through the agency of the local committees of schools of art, is given directly to the managers of the schools, who also aid in the conduct of the examinations of the children. In 588 schools 79,411 children have been taught drawing during the past year; in 1866, 80,084 children were taught in 560 schools for the poor.

Examination of Teachers in Training Schools.—Students in training schools for elementary teachers are annually examined in drawing, in November. This year 2,161 were examined; 1,382 passed in one or more of the subjects required for a certificate, and 175 obtained certificates of competency to give instruction in drawing concurrently with writing.

Grants in aid of the purchase of examples have been given on 147 requisitions from art schools or drawing classes to the amount of £225 18s. 7d. In 1866, 192 grants amounting to £256 12s. 10d. were made.†

* This seems a very few.—Ed. *J. S. A.*

† The grant has lately been increased to 75 per cent. of the cost.—Ed. *J. S. A.*

The grand total of persons taught drawing through the agency of the department, and the amount of fees paid, have been as follows during the last three years:—

	Numbers taught.	Fees paid.
		£ s. d.
1865	103,588	19,592 15 0
1866	104,668	18,676 18 0
1867	105,529	17,805 0 0

Payments of Results.—The following table shows the number of payments made on the results of examination.

Nature of Payment.	1866.	1867.
1st Grade.—1s., 2s., or 3s. on account of children taught in schools for the poor	29,827	29,385
2nd Grade.—10s. on account of students in schools of art and night classes	2,935	3,606
3rd Grade.—10s. on account of elementary works executed in schools of art and night classes (increased to 15s. in 1867)	1,597	1,742
3rd Grade.—15s. on account of advanced works executed in schools of art (increased to 20s. in 1867).	486	512
3rd Grade Certificate.—Payment of of £10 on each student obtaining an art-teacher's certificate	6	6
Total....................	34,851	35,251

Prizes.—The total number of prizes issued has been as follows:—

Nature of Prizes.	1865.	1866.	1867.
1st Grade Prize (Poor Schools) ..	9,491	3,772	3,655
2nd Grade Prize	1,550	1,298	1,369
3rd Grade Prizes issued	892	743	635

The details relating to instruction in art will be found in the report of the official inspector, Mr. Bowler.

In the national competition, 10 gold, 20 silver, and 52 bronze medals were awarded, together with 33 prizes of books. These take the place of 100 medallions for competition in former years.

SCIENCE AND ART.

The influence of the Department of Science and Art throughout the United Kingdom, estimated only by the numbers of persons who have attended the schools and museum, is stated in the fifteenth report of the Department to be as follows:—The system of science and art instruction has reached 10,230 individuals in science, and 105,529 individuals in art. The students at the School of Naval Architecture numbered 44, at the School of Mines 13 regular and 102 occasional, and at the College of Chemistry 121. At the evening lectures there was a total attendance of 2,207.

At the Royal College of Science for Ireland there were 35 individual students; 4,958 persons attended the various courses of lectures which were delivered during the year in connexion with the Department in Dublin; and a course of lectures at the Edinburgh Museum of Science and Art was attended by 790 persons.

The total number of persons, therefore, who have received direct instruction as students, or by means of lectures, in connexion with the Science and Art Department, is about 123,500, being an increase of over 10,000, or nearly 9 per cent. on 1866, when the numbers were about 113,000.

The attendance at the museums and collections under the superintendence of the Department in London, Dublin, and Edinburgh has been 1,305,374, showing a total increase of 152,374, or 13·2 per cent. on the numbers of the preceding year, which were 1,153,091.

The attendance at the Educational and Art Libraries, and at the library of the Royal Dublin Society, shows a satisfactory progress. The numbers in 1867 were 32,665, or 5,392 more than in the preceding year.

The returns received of the number of visitors at various local exhibitions to which objects of art were contributed from the Art Museum show an attendance of upwards of 62,000 persons.

The expenditure of the Department during the financial year 1866-7, exclusive of the cost of the geological survey, was £152,856 18s. 1d., while in 1867-8 it was £179,950 6s. 1d., showing an increase of £27,093 8s.

We can confidently report that at no period since the establishment of the Department has its influence in promoting the knowledge of science and art, especially among the industrial classes, been so widely extended or its beneficial results so marked as during the past year. The increased grants for which Parliament has made provision in the vote for science and art for the current year, supplemented as they are by private munificence, will, we trust, enable us to effect an appreciable advance towards affording to all classes of Her Majesty's subjects opportunities for acquiring instruction in the sciences and arts which are applicable to productive industry.

NEW EDUCATIONAL ESTABLISHMENTS IN FRANCE.

The Emperor and his ministers are earnestly occupied with the extension and the improvement of the means of scientific and industrial education, and some of the results are now before the world.

In the first place we have the programme of the École des Mineurs of Saint Etienne, destined to train young men for directors of mines and mineralurgical works, and also for minor employments in the same. The course of study is entirely gratuitous, and includes the following subjects:—The working of mines; the nature of the strata and their principal mineral elements; the art of assaying and of treating minerals; the elements of mathematics; the powers of resistance; and the general nature and mode of employment of materials used in the construction and working of mines, workshops, and transport ways; book-keeping by double entry; and mechanical drawing.

Diplomas of capacity of several degrees will be granted to the pupils on the completion of their studies. The conditions of admission are laid down in a programme to be obtained at the offices of the Minister of Commerce; the candidates must possess a knowledge of the French language, of arithmetic, geometry, algebra, rectilinear trigonometry, and descriptive geometry, to the extent required for the degree of bachelor of sciences; of chemistry to the same extent, metallurgical chemistry excepted; a good knowledge of natural philosophy; and the elements of linear and free-hand drawing, and practical geometry. The candidate must have attained the age of sixteen, and, with the exception of those who have served in the army or navy, who are received until the age of twenty-eight, must be less than twenty-five years of age. The candidates are examined in the first place by an engineer of mines or an engineer of roads and bridges, and, finally, before the council of the school. Young men who have passed through the polytechnic school are not subjected to the preliminary examination. The council of the school will determine the order of merit of the candidates, but the admissions to the school are left to the minister.

The Emperor is said to be engaged at present with the arrangements for the foundation of an Imperial

Academy of Agriculture, founded on the pattern of the Academie Française, with forty chairs, the members to be elected by the *Comices Agricoles* of the whole of France. The duties of the new academy will not, it is said, be confined to the study of agricultural questions; it will be endowed with certain powers with respect to regional exhibitions of agriculture, the prizes to be awarded, and the reforms demanded, and, above all, in the direction to be given to primary instruction in relation to the right, duties, views, and wants of the rural population. The academy is to receive an endowment from the state, but will also receive local and individual subscriptions.

But the most important event in connection with scientific education came before the public on the 6th of the present month of August, in the form of a long report by the Minister of Public Instruction, accompanied by two Imperial decrees. The objects of these documents are, to give literally the expressions of the title of the report, the establishment of laboratories both for study and research, and the creation of a practical school for high scientific studies.

The great length and importance of these documents compels us to defer their analysation for the moment, but we may mention that it is not intended to create entirely new establishments or a separate staff of professors. "The sites," to quote the expressions of the report, "will be the amphitheatres and the laboratories of our great institutions; the professors, those of the College of France, of the Museum, of the Sorbonne, &c."

The decrees are already in action, for a register is announced to be open at the Sorbonne for the reception of the names of candidates for admission.

The new school is the extension of the principle applied recently to the secondary education of girls to general scientific education. We may add that the school is to consist of four sections:—1. Mathematics; 2. Natural philosophy and chemistry; 3. Natural history and physiology; 4. Historical science and philology; to which may be added hereafter a fifth section for juridical studies.

ART SCHOOLS IN PARIS.

In the year 1851 the following establishments for instruction in drawing and the decorative arts existed in Paris. The Imperial Mathematical and Drawing School (Ecole Impèriale de Dessin et de Mathématiques); the Free School of Design for Young Girls; five schools aided by the city of Paris, of which two were female schools; and seventeen courses of instruction in drawing attached to the adult classes. At this date the sum set apart annually by the municipality of Paris for art education only amounted to 39,000frs.

Since the year 1851, both the number of schools and the grants in aid have very largely increased. This increase is, in great part, due to the reports of the French jurors at the Exhibition of 1862, who were loud in praising the great advance made by England in design and decoration since the development of her art schools, and who did not hesitate to express an opinion that much must be done in France to enable her to keep her place in the front rank of industrial art. In 1867 the sum devoted by the municipality to the aid of art and drawing schools, amounted to no less a sum than 321,395 francs, and to those existing in 1851 the following establishments have been added:—One male and eighteen female schools of design; twelve adult classes for men; sixty-two courses of drawing under certificated teachers in the lay boys' schools, and ten special courses in the so-called Central Schools (Ecoles dites Centrales) for the pupils of the one hundred and ten public girls' schools. In addition to this, the boys' schools, under the supervision of the religious orders, have given increased efficiency to their long-established courses, both of ornamental and linear drawing, by the appointment of more teachers, and by providing numerous and well-chosen copies and models.

All this, however, goes no further than the encouragement of elementary art education; between the School of Fine Art (Ecole Impériale des Beaux Arts), which is intended for the training of artists, and these primary schools of art, there is found a want of a superior school, like our own normal school at South Kensington for training teachers. For females this requirement has already been met by the institution of Notre-Dame-des-Arts, described in a former number of the *Journal*. An establishment for advanced instruction in art for men is now in course of being formed.

It is proposed:—

1. To create a museum and library of applied art, consisting of objects presented or lent for a certain period; the collection to be continually augmented by specimens, models, or photographs of all the art-products manufactured in France.*
2. To found a superior and central normal school of industrial art.
3. To organize special exhibitions of designs and works of art, with competitive prizes.

A portion of this programme has already been carried into execution by the Central Society of Applied Art (Union Centrale des Beaux Arts Appliqués). This society is already favourably known by its periodical exhibition at the Palais de l'Industrie, and of works of art of different epochs. The last of these exhibitions was enriched by many objects lent by celebrated collectors, and was very numerously attended. The project of a museum and library, to be opened in a room in the Place Royale, is still in embryo; but the normal school is in course of being organized, and, by special permission of the Minister of Public Instruction, it is to have the title of college—"Collège des Beaux-Arts Appliqués à l'Industrie."

THE NAVAL SCHOOL AT BREST.

Napoleon, in 1810-11, established the first naval school ships in France, the *Tourville* being appointed to that purpose at Brest, and the *Duquesne* at Toulon. These schools were placed under the orders of the maritime prefects of the two localities. In 1816 these two schools were abolished by decree, and a royal marine college was established at Angoulême. Several other changes took place, and in 1830 the college was replaced by a naval school on board the *Orion*, an old 74; this vessel has been succeeded by several others, all of which have received the name of the second schoolship, the *Borda*, named after Captain Borda, a naval officer of great scientific and practical ability. The present ship is a noble three-decker, pierced for 120 guns, was launched in 1847, and was in the Crimea. The *Borda* is stationed at Brest, and its rig has been reduced to that of a frigate. The forepart of the second gun-deck of the vessel still retains something of its old character, and is provided with six guns on each side for practice. The other parts of the vessel have been completely altered; the decks have been cut away, so as to form two large lecture-rooms and two school-rooms. Not only the pupils but also their professors and most of the officers are lodged on board the vessel. On deck are specimens of various kinds of guns in use in the French navy and a gymnasium. The quarter-deck, which is continued to the mainmast, is divided, the forepart being appropriated to the pupils, and the aft to the officers. The commander of the *Borda* is a full captain, and the instruction, which is practical as well as theoretical, is confided to eleven professors, of whom five belong to the hydrographic department, eight full lieutenants, and a principal engineer. The duties of the five hydrographic professors are thus

* To carry out this part of the project in its integrity a law would have to be passed similar to the one enforcing the deposit of new books in the public libraries.

divided:—Two teach astronomy and navigation, two analytical and mechanical science, and the last natural philosophy and chemistry. The duties of the other professors are thus arranged:—Two for literature, history, and geography; two for the English language; and two for drawing. The lieutenants direct four courses of instruction, namely, naval architecture, the theory and practice of managing a ship, gunnery and small arms, with practice, and nautical calculations. The engineer professor teaches the theory and management of steam engines and mechanics. The other officers are a captain of frigate (second in command), a chaplain, a financial and an administrative officer, and two medical men. Besides these there is a captain of gunnery and several under officers of the marine and of artillery.

The school session commences on the first of October, and on that day promotions are made of the pupils in the various classes. Those who have passed two years of study in the ship are called grand antients, and rank with naval aspirants of the second class, and are eligible to make a voyage of circumnavigation in another vessel appropriated to that purpose; pupils who have been one full year in the *Borda* are called ancients, and the rest new boys, or in French naval language, *Fistots*. The boys have each a number, and in all the ordinary routine of the school ship, this takes the place of a name.

The elder pupils are employed as monitors over the younger, and each of the former has one or more nominated to him, not as a fag, but as a scholar, whom it is his duty to teach all he himself knows. It is said that this system succeeds admirably, and that for the first few months the instruction of the new comer is left almost entirely to his *ancient;* and the new pupil thus escapes without difficulty many errors of discipline in which he would otherwise infallibly fall.

The discipline of the school is severe; the boys are up every morning, all the year round, at five o'clock, stow away the hammocks in which they sleep, attend prayers, and then commence their morning's work.

The boys are well fed. They have coffee or chocolate in the morning, dinner (old style) at 12 o'clock, a hunch of bread (*goûter*) at 4.30, and supper at 7.45, with bread *à discrétion*, or as much as they please, and about four-tenths of a pint of wine at each of the two principal meals.

The morning studies are given to science; those of the mid-day to practise with guns, or practical study, marine machinery, or drawing; and the evening to literature, the English language, or naval architecture. All the studies take place on board, with the exception of natural philosophy and chemistry, the professor of which has at his command in the town the collection of instruments and chemicals, as well as the lecture-room and laboratory of the central pharmaceutical establishment. At times, also, the pupils are taken to visit the vessels in course of construction, and the workshops in the arsenal, and to practice with small-arms on shore.

There are eight boats attached to the *Borda*, and the pupils are practiced almost every day, and in all weathers, in rowing and sailing, under the eye of an officer, who watches the exercices from on board a small steam gunboat attached to the school. The ordinary studies of the school finish between six and seven in the evening, and the pupils turn in at nine o'clock for their eight hours' rest.

Thursday and Sunday, as usual in France, are exceptional days, when, after nautical calculations, which are never omitted, the elder pupils, or *ancients*, practice with small-arms on shore, and the juniors are drilled in the use of the sword, musket, and bayonet. After this they have six hours' hard work in manœuvreing two small corvettes, provided for the purpose, that belonging to the "ancients" being a screw-steamer.

The boys, as a rule, are at liberty on alternate Sundays, and the most advanced every Sunday afternoon; this is a recent innovation; the pupils used to be scarcely free more than once a month, but this gave rise to much discontent and some disturbances, and the rule has therefore been made less severe. In addition to this liberty, however, all the lads are allowed to see their friends for a short period on shore during the exercises on shore on Sunday and Thursday mornings, and those who are not free on Sunday are taken on shore for a change in the afternoon. During the summer months the boys bathe in the sea, at a place called Lanninon.

One curious custom exists in the school—the boys are allowed to smoke during the hour of recreation after dinner and at certain other times; the reason for this is, that as it was found utterly impossible to stop the practice entirely, it was better to recognise it in moderation, and thus stop its secret indulgence with the danger of fire.

The punishments inflicted in the school are extra drill and confinement, either in a small cell or in a dark hole, with a regimen of bread and water; for very grave offences boys are dismissed or expelled. On the other hand, the marks for good conduct are numerous; there are several examinations in the various classes during the nine months of the scholar year, and those pupils who gain the greatest number of marks are called *élèves d'élite*, and wear a gold anchor on their collars, or, in the case of the first twelve, two anchors; the pupil who has gained the highest number of marks bears the proud but merely nominal rank of *first brigadier*, and he who enters the school with the greatest success at the examination is called *major*. A general examination takes place at the end of the year, when the *ancients* who pass become *aspirants* in the navy, and the juniors are raised to the upper class in the school; those who fail in the examination are either sent back to their class, or rejected as unfit for the naval career. The first and second prizemen, on quitting the school receive each a quadrant in the name of the Emperor, and the third a telescope.

The elder pupils have nearly three months' holiday, but the junior pupils pass a month on board another vessel, the *Bougainville*, for what is called the summer campaign. This vessel, which was constructed specially for the school, is a screw despatch boat, with engines of 120 horse-power; the summer voyage is settled by the Minister of Marine, and includes a visit and examination of the ports of Lorient and Cherbourg, touching at some remarkable points of the French coast, and casting anchor sometimes off the English coast, and sometimes running as far as Ferrol in Galicia.

The *grand ancients*, when their holidays are over, that is to say on the 1st of October, join the *Jean Bart*, which makes an annual voyage of several months' duration. This vessel was built in 1852, and made its first voyage of this kind in 1864-5. She is an 80-gun ship, of the mixed class, having engines of 450 nominal horse-power; in August in the present year she will have completed her fourth and last voyage of circumnavigation, another vessel, the *Donawert*, now being prepared to succeed her. The upper gun-deck of the *Jean Bart* is disarmed, and converted for the use of a part of the officers and the pupils, who number about a hundred, and occupy eight cabins, each with two portholes; here the young men eat, drink, and sleep, as well as pursue their studies.

The officers of the *Jean Bart* consist of a full captain in command, a second captain, a chaplain, ten lieutenants, one having charge of each pupil's cabin, or *poste*, as it is called, and two giving instruction in sailing and gunnery; a surgeon-major, who gives instructions respecting the means of keeping a crew in health; two assistant-surgeons, an engineer, a drawing-master, and some others.

The Minister, as in the case of the summer cruise of the junior pupils, settles the course to be taken by the *Jean Bart*. Generally the West India Islands are visited in the months of March and April, when the pupils are principally exercised in hydrographical works off St. Pierre and Fort de France; in gunnery, on board; and small-arms on shore; in the daily management of boats for embarcation and disembarcation; and in the manage-

ment of sails in the intricate channels of the archipelago. They are shown, moreover, how to perform difficult operations, such as the unshipping of the rudder and bringing it on deck for examination, lifting a mast, &c. The pupils are required to keep written records of all such operations, and to illustrate the narrative when necessary with drawings. When they visit foreign yards and arsenals they are expected to give minute accounts of what they have seen there, and, besides a daily journal, to write critical notices of all the different machines, methods of rigging, and manœuvres which they have witnessed.

The difficult channel of the Isle St. Sebastian, off the coast of Brazil, that of Bermudas, the river Hudson, and the coast of Newfoundland, are amongst the places selected to initiate the pupils in the difficulties of navigation. At Annapolis, in the *Chesapeake*, a visit is paid to the naval school of the United States at the season when the general examinations take place in that establishment. The voyage usually terminates with a visit to Cape Breton, and some points of Newfoundland; the fisheries and drying-houses of St. Pierre and Miquelon are generally visited, and the *Jean Bart* returns to Brest between the 1st and 15th of August, having been absent ten months. A sailing brig, named the *Obligado*, has lately been attached to the *Jean Bart* as a supplementary vessel.

The above sketch will give a fair idea of the means which the French Government adopts for the education of its future naval officers.

RAILWAY WAGONS FOR MEAT TRANSPORT.

The adoption of refrigerator cars for bringing dressed beef, pork, mutton, and poultry from the Western States to the seaboard cities, promises most important results. Under the old system of putting the live animals into the cars and transporting them eastward, they almost invariably suffered a large decrease of weight from want of proper feeding and watering. Those who have seen cattle trains on a hot day will understand something of the torments to which the cattle have to submit and the probable effect upon the flesh as human food, of their long confinement in these pest houses denominated "cattle cars." Persons of delicate organization have been known to faint from the effects of the stench of the passing trains, and the effect upon the health of the animals must be very prejudicial, rendering them unfit for human food. By the adoption of the refrigerating car all this can be changed for the better. The cattle are slaughtered and dressed when in their best condition, and the meat there packed directly into the car, and thus transported to the points of consumption. These cars are of the eight-wheeled freight pattern, built of two thicknesses of three-quarter inch pine plank, three inches apart. In the intervening space, three-inch slabs of cork are inserted, cork being considered the best non-conductor of heat. On the top of the car is a flutter wheel of zinc, working horizontally by the current of air created during the motion of the train. On the same spindle with this wheel is a revolving fan, which throws the air through flues, the entire length of the car to the ice-chambers at each end. It is here cooled and condensed, and falls through other flues to the floor, passing under the hanging meat, and enveloping it as it rises to the ceiling. The temperature maintained is forty-two degrees.

These cars can carry from 20,000 lb. to 25,000 lbs. each, and the meats invariably come forward in excellent condition. The benefits of this system in brief are: a saving in weight to the owners of the cattle, the abolishment of slaughter-houses in or near cities, the retention of the refuse matter to be returned to the soil through the compost heaps where the cattle were raised—a most important matter—and the improved character of the meat brought to market. If there were no question but that of the greater humanity of this method of treatment of cattle, it ought to be decisive in favour of this system, but there are other questions all in favour of it. For sanitary reasons the system should be adopted; first, that it enables cities to get rid of slaughter-houses, those great pests of every inhabited neighbourhood. Second, that the meat is preserved in a more healthy and fit state for human food. The return of the refuse matter of slaughtered cattle to the soil, thus enriching it with those elements which enter into the growing of cattle, is a matter which the more intelligent agriculturists and cattle breeders will properly estimate, and one to which we hope they will give due emphasis in the discussion of this question in the agricultural journals.—*American Railway Times.*

Manufactures.

FRENCH UPHOLSTERY.—The raw materials used in the manufacture of fabrics for upholstery are very numerous. The organzines of France and Piedmont, the wefts of China and Japan, are used in the manufacture of the silk fabrics. The price of these materials has much increased during the last few years. It is now at 120frs. to 130frs. for the warp, and 110frs. to 120frs. for the weft. The French silk is the dearest and the most esteemed. The manufacture of reps and table-cloths is composed of French wool, valued at ten or fifteen francs the kilogramme, and floss silk, worth from forty to sixty francs, which is chiefly derived from Switzerland. Utrecht velvet is made of goats' hair, spun in England, and sold at from nine to thirty francs the kilogramme, according to its purity. Horse-hair fabrics are woven of materials of French origin; that which comes from Buenos Ayres is much more expensive, costing from sixteen to thirty francs. Woollen damasks are woven with wool coming from the north of France; the weft is worth from seven to eight francs the kilogramme, the warp from nine to ten francs. For the mixed silk fabrics, they use warp at a price of fifty to sixty francs the kilogramme. The Algerian fabrics are composed of cotton warps and woollen wefts, worth from five to six francs the kilogramme. The price of the cotton fabrics, such as calico and cretonne, used for making prints and chintzes, is from fifty centimes to 1 fr. 50 c. per metre; these fabrics are woven in Alsace and Rouen. The cloth used in upholstery is manufactured at Mouy; the widest, used for table-covers, is worth in its rough state three francs the metre; and that used for covering furniture about eight francs the metre. The printing of the calico, cretonne, and textile fabric, is performed principally at Mulhouse, Rouen, and Claye; the cloth is printed in Paris. The carpet manufacture employs English and French wool; the minimum price for the ordinary qualities is eight francs the kilogramme. Tapestry is made of unmixed English wool, which costs, without dyeing, from twelve to fifteen francs the kilogramme. The embroidered cotton fabrics come from Tarare and its neighbourhood; the figured muslins from St. Quentin. The flax yarn for tick is spun at Lille. The figured fabrics used in upholstery are woven in the Jacquard machine; the plain fabrics are partly woven in power looms; the embroidery and tapestry is produced by hand; but they are beginning now to manufacture carpets by machinery. The printing is accomplished by cylinders or plates. The cost of manufacture amounts to 10 or 15 per cent. of the value of the common articles; to 20 or 25 per cent. in that of the better fabrics; and to 30 or 40 per cent. of that of the most expensive articles. The average amount of general expenses is 10 per cent. of the value of the production, without counting the cost of the designs and the inventions, which is often very considerable. Plain fabrics, at least those which are worked by hand, are manufactured in the homes of the workmen, in the neighbourhood of the principal manufacturing centres; for instance, the Utrecht velvets are woven in the

environs of Amiens, by workmen who also cultivate the ground. Figured and fancy fabrics are usually manufactured in large workshops. In the upholstery trade, only about 30 per cent. of the hands employed are women. Paris is the principal market for all kinds of fabrics for upholstery; those manufacturers who have no depôt in Paris have always an agent of some kind. Many manufacturers only work for one or two Parisian wholesale houses, and refuse all other business; and this association between the manufacturer and the Parisian salesman results from the absolute necessity of dividing, and thereby diminishing, the risks of manufacture (often considerable) in the production of those fancy articles of which the consumption is relatively small aud variable. The manufacturers of hand-made tapestry only work to order, for a new pattern has to be made for almost every buyer. Those who make carpets by machinery prepare their designs beforehand, of the different sizes accepted in the trade, so as to always have a large assortment on hand. The manufacture of fabrics for upholstery is one of those for which France is most justly celebrated; the tapestry of the imperial manufactories of Gobelins and Beauvais are without a rival. The production of these fabrics is estimated at about 60,000,000. The exportation of carpets and tapestry is now very large. French woollen manufactures bear comparison with those of the best foreign markets; and their silk fabrics are unrivalled. Among the principal improvements introduced since 1855 are:—Firstly—The great extension of steam machinery. Secondly—The introduction of a machine with eight and ten rollers, printing fabrics with that exquisite perfection of colouring which formerly could only be produced by hand.

Colonies.

TOBACCO.—An excellent sample of tobacco has lately been shown, manufactured by Mr. Norrie, of West Maitland, New South Wales. This sample is similar to that which he exhibited at the late agricultural show, and obtained the prize, but its having now acquired a little more age, the tobacco is in a better condition than at the time of the show, and will bear favourable comparison even with tobacco manufactured from American leaf. This tobacco smokes with a pleasant taste, and leaves a pure white ash, and is free from that acidity which often characterizes colonial tobacco, and arises chiefly from want of care in drying the leaf. It is now evident that it needs only proper attention to the various stages of the manufacture for colonial makers to produce an article of a very superior description to that usually found in the market.

FLAX.—Flax cleaning operations are being steadily extended in the country districts of South Australia, and as superior samples of this valuable commodity have lately been finding their way into market, an increased price has been obtained. A large rope-manufacturing firm in Sydney have despatched an agent to this province to purchase at least 30 tons per month, and it is stated that negotiations are pending for the lease for a term of years of 2,000 acres of swamp in the Waikato for the growth of flax to supply a paper-mill recently established near Sydney. The last quotation of the article is £30 per ton.

Obituary.

MR. GEORGE ROWDEN BURNELL.—George R. Burnell, known as the writer of several scientific works, died at his residence, in Kensington Garden-terrace, on the 23rd July last, in his 54th year. His attainments were numerous. He had an extensive knowledge of languages, and had resided in America, France, and Belgium, besides visiting Spain and Sardinia. About seven years of his life were spent in France, during which time he was engaged on the Paris and Rouen Railway, and as superintending architect of the Havre Docks. On the cry being raised of "*La France pour les Français*," in 1848, he returned to England. Though he executed several works both here and abroad, his bent was decidedly literary. He contributed several articles to the *Builder* early in his career, especially on roofs. In 1857 he wrote a rudimentary work on "Limes and Cements;" in 1861, "The Annual Retrospect of Engineering and Architecture." He edited "The Builders' and Contractors' Price-book," and "The Engineers' and Architects' Pocket-book." He was connected, too, with the *Journal of Gaslighting* for many years, and wrote several papers for the Society of Arts, and for the Instution of Civil Engineers, for which he received prizes. He was the author of many articles in Brande's "Dictionary of Science," and in the "Dictionary of Architecture," published by the Architectural Society, especially one on the word "Abattoir." Mr. Burnell was a relative of Mr. W. Tite, M.P., and at his suggestion was made a member of the Government Committee appointed to inquire as to the preservation of the stone of the Houses of Parliament—a committee, by the way, that sat long, published a useful report, and never received the slightest acknowledgment of its services. He was elected a member of the Society of Arts in 1860.

Publications Issued.

BOOK-KEEPING. By R. G. C. Hamilton and John Ball. *(Macmillan and Co.)*.—This is one of the Clarendon Press series, and, in a small compass gives the theory and practice of this art. The work is named as one of the text-books which may be consulted with profit by those proposing to go in for the Society of Arts Examinations.

Notes.

STRIKES IN THE TIME OF EDWARD III.—When Edward III. was rebuilding Westminster Palace, so many workmen and labourers withdrew from his works, that he issued a proclamation that no one was to employ them under penalty of being sent to the Tower; but no difficulty with the men is recorded to have taken place here. This smooth-sailing was, perhaps, due to the observance of certain articles drawn up by the trade, which we are about to notice. From Mr. Riley's documents it appears that about three years after the "strike" at Westminster the corporation took the masons in hand. Solid, hard-handed, slow-thinking men they were, not particular about such trifles as the way their names were spelt, or whether they had any surnames at all; though not clumsy, very precise over the way they did their work, and determined that no one should do it in any other fashion. The mason hewers set themselves against the light masons and setters, and their disputes seem to have been very frequent and tiresome, when the mayor undertook to investigate their case. He attributed their dissensions to the fact that their trade was not regulated "by the government of folks of their trade," and agreed to receive twelve of their representatives, who should draw up a code of articles by which, for the future, it should be ordered and ruled. Six masons on behalf of the hewers, and six on behalf of the light masons and setters attended this conference. The regulations, which were drawn up in Norman-French, were briefly thus:—Every man might work in any branch of the trade, if skilful at it; "good folks" were to be chosen and sworn to see that no mason undertook work that he was not able to do, under penalty of fine and expulsion. No one was to take work in gross (wholesale or by contract)

if he had not ability to complete it in a proper manner. He who did undertake such work in gross was to take with him to the employer six or four ancient men of the trade to testify that he was able to perform it, and take upon themselves the responsibility of finishing it if he should prove unable to do so. No one was to set an apprentice or journeyman to work, except in the presence of his master, before he was perfectly instructed. No one was to take an apprentice for less than seven years. The masters that were chosen to superintend the trade were to oversee that those who worked by the day took for their hire what their work was worth, and asked no outrageous pay. If any objected to be ruled by these persons, his name was to be reported to the mayor, who with the consent of the aldermen and sheriffs, would imprison or otherwise punish him, "that no other rebels may take example by him, to be ruled by the good folks of their trade;" and, finally, no one was to take the apprentice of another to his prejudice or damage, until the expiration of their term, under penalty of half a mark for each conviction.—*Builder*.

New Manures.—In a paper read before the British Association at Norwich, Mr. Read, M.P. for Norfolk, says:—"Already the constant repetition of the same crop is acting prejudicially to the Norfolk farmer. Clover sickness is a common complaint; and no chemist can tell us what it is that the clover extracts from the land which our manures do not return to it; nor have they suggested any treatment which has in the slightest degree mitigated the evil. It is feared that turnips are showing signs of a similar ailment; anyhow, it is certain that the same dressing of manure fails to produce the same weight of roots as it did 25 years ago."

Patents.

From Commissioners of Patents' Journal, September 4.

Grants of Provisional Protection.

Boots, &c., removing dirt from the bottoms of—2625—G. Tidcombe.
Brewers' finings—2561—E. Beanes.
Brewing apparatus—2602—T. Haigh.
Brick-making machinery—2636—R. Scholefield.
Bricks, tiles, &c.—2630—W. H. Tooth.
Bricks, &c., composition applicable to the manufacture of—2629—O. C. Setchell.
Buildings, apparatus to be employed in the construction of—2612—J. Tall.
Cages, &c.—2555—C. Mohr and S. E. Smith.
Cans, &c., closing—2421—C. J. L. Nicholson.
Carriage springs, &c.—2565—J. Palmer.
Cartridges—2033—W. H. Crocker.
Cartridges—2628—W. R. Lake.
Casks, &c., bushing the bung-holes of—2633—H. Ground.
Clothing, &c., disinfecting—2544—G. Nelson.
Coal, &c., cutting—2643—J. Gillott and P. Copley.
Copper, &c., smelting—2600—H. C. Ensell.
Cotton, &c., threads of, preparing for the market—2593—W. J. Almond.
Despatch boxes, &c.—2607—F. J. Knewstub.
Dress fastenings and ornamental appendages—2635—R. Couchman.
Dyeing, &c., red colour for—2017—J. H. Johnson.
Earthenware, &c.—2586—J. H. Atterbury.
Electro-magnets—2571—A. Albini and J. Vaglica.
Fabrics, woven—2656—S. R. Samuels and J. Birks.
Feed-water heaters—2596—H. N. Waters.
Fire-arms, breech-loading—2645—A. M. Clark.
Flax, &c., preparing and spinning—2579—D. Fraser.
Furnaces—2627—A. Goodman.
Furnaces, blast—2617—J. Watson.
Grain, cleaning—2567—J. H. Johnson.
Grain, &c., preparing and manuring before sowing—2626—A. F. Eckhardt.
Heald warpers—2623—W. Chorlton.
Heat, &c., non-conducting composition for preventing the radiation or transmission of—2492—F. Le Roy.
Horizon, artificial, used for taking altitudes—2624—C. George.
Horses, roughing—2620—H. Thompson.
Illuminated devices and designations—2616—F. M. B. Bertram.
Lamps—2445—C. F. C. Cretin.
Leather, compound for tanning—2589—A. Clark.
Linen, &c., drying—2590—W. H. Davey.
Looms—2306—T. F., J., C. H., and E. Firth.
Looms—2613—T. Wrigley and J. Holding.
Looms—2650—J. Hamer.
Memoranda, &c., apparatus for receiving—2639—B. J. Cohen.
Mills for grinding—2575—J. G. Tongue.
Millstones, dressing—2614—A. B. Childs.
Motive-power engines—2654—W. L. Williams.
Motive-power, obtaining—2572—H. J. Behrens and E. Dart.
Motive-power, &c., obtaining—2581—E. Ledger.
Mowing and reaping machines—2652—R. W. Morgan.
Mules, self-acting, for spinning, &c.—2649—S. Morris.
Music books, &c., machinery for turning over the leaves of—2533—J. Grant.
Needles, &c., flattening heads of—2641—J. Barrans.
Oil testers—2592—T. R. Shaw.
Ores, &c., decomposing the sulphurets of iron contained in—2562—B. Hunt.
Pianofortes, apparatus for attaching to, in order to facilitate the study of the notes—2595—G. Calkin.
Pumps—2587—J. Norbury and J. Shaw.
Railway breaks—2597—P. Robertson.
Railway rails—2591—J. Heaton.
Railway rails, uniting the ends of—2621—W. R. Lake.
Railway trains, communication between passengers, guards, and engine drivers—2609—J. L. Clark.
Resinous sudations, administering—1505—W. E. Gedge.
Rotary engines—2601—A. V. Newton.
Rotary engines—2651—W. Hall.
Rotary or centrifugal machines—2608—T. W. Rammell.
Sand, &c., grinding—2549—J. Fletcher, sen., J. Fletcher, jun., and W. Fletcher.
Sewing machines—2599—H. Hughes.
Sewing machines—2646—R. Harvey.
Sewing needles, holders for—2631—G. J. Colette.
Shaft tugs—2648—J. Dawson.
Ships' propellers—1435—H. A. Bonneville.
Ships' signal lamps—2577—J. S. Starnes.
Steam cultivators—2279—R. Brett and G. Daniels.
Stearine, manufacturing—2647—A. E. Borgen.
Stoves, &c.—2569—W. Corbitt.
Stoves, &c.—2573—J. Phillips.
Sulphate of iron solution, treating and utilising waste—2588—F. Braby.
Tents—2557—J. H. Dearle and T. Brown.
Timber, cutting—2642—J. J. Long.
Tools for cutting tubes, &c.—2583—W. Thomson.
Vapour, condensing—2644—J. H. Johnson.
Walls, &c., constructing—1416—S. Parr and A. Strong.
Water meters—2563—B. P. Stockman.
Wheat, &c., manufacturing into flour—2605—J. H. Johnson.
Wheels and tyres—2610—B. Walker and J. F. A. Pflaum.
Window sashes—2594—J. Sawyer.
Wool, &c., washing—2582—L. Gay.

From Commissioners of Patents' Journal, September 8.

Patents Sealed.

757. J. Hammersley.
758. H. A. Dufrené.
760. W. R. Lake.
764. J. L. Clark.
766. J. B. Fell.
773. I. L. Pulvermacher.
775. J. M. Stanley.
776. T. Whittaker.
777. J. Eastwood.
779. W. Langwell & H. Spring.
786. J. G. Tongue.
791. H. Symons.
798. J. and J. Thompson.
800. W. W. Greener.
801. F. J. Baynes.
810. A. F. Baird.
812. H. Willis.
814. E. Morewood.
815. W. H. Halsey.
817. P. F. Halbard.
820. W. B. Kinsey.
839. S. Naylor.
840. M. T. Shaw and T. H. Head.
846. W. Thompson.
851. A. P. Stephens.
852. J. Hodgeson.
854. A. and E. Geary.
864. H. Kershaw.
866. S. H. Salom and T. Field.
896. J. S. Gee.
925. J. B. Linnett.
935. G. Davies.
956. G. Twigg and H. Bateman.
957. S. Duer.
958. G. Davies.
961. G. Macdona & O. Hilliard.
962. W. S. Boulton.
1007. A. Elliot and J. Barker.
1082. A. B. Walker.
1096. J. H. Johnson.
1109. R. J. Morison.
1114. T. Baker.
1164. E. Watteeu.
1289. G. Coles, J. A. Jaques, and J. A. Fanshawe.
1296. G. Coles, J. A. Jaques, and J. A. Fanshawe.
1334. C. B. and J. Hardick.
1434. H. A. Bonneville.
1463. C. D. Abel.
1796. D. Jones.
1800. C. H. Wells.
1940. K. Malster.
2211. W. R. Lake.
418. A. B. Ibbotson.

Patents on which the Stamp Duty of £50 has been paid.

2265. S. Chatwood.
2274. R. A. Brooman.
2277. J. Grand.
2337. W. J. Murphy.
2363. A. V. Newton.
2369. H. A. Bonneville.
2465. A. V. Newton.
2294. J. M. Hart.
2300. W. L. Wise.
2355. J. Wakefield.
2397. D. J. Fleetwood.
2279. T. T. Ponsonby.
2315. G. T. Bousfield.
2569. G. W. Rendel.

Patent on which the Stamp Duty of £100 has been Paid.

2203. F. E. Schneider.